



KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT

UNDERGROUND HYDROCARBON STORAGE (UHS) CORE PROCEDURE

Procedure #: UICLPG-16
(8/04)

Narrative:

K.A.R. 28-45-6(i) requires that each permittee of an underground hydrocarbon storage facility submit a core and core analysis to the Kansas Department of Health and Environment (KDHE). As specified in K.A.R. 28-45-6 (i)(1), each permittee shall submit a core plan to the Secretary for review and consideration for approval at least 60 days prior to the coring event.

Procedure:

Coring Intervals

Select coring intervals that include both the overburden and the salt formation. If a gamma-ray log for a nearby well is available, submit the log with the appropriate core intervals marked on the log. The coring intervals must be approved by KDHE.

Test Well Description

Submit a drilling plan for the test well.

Provide a description of the test well. Include the casing size, borehole diameter and depth for the surface casing, cased hole, and open-hole (core interval).

Describe measures for containment and disposal of drilling waste to prevent contamination of soil and groundwater.

Ensure that the test well will be drilled following standard drilling safety precautions.

Submit an intent-to-drill form if required by the Kansas Corporation Commission.

Submit a plugging plan for the test well to KDHE for review and approval.

Well Logging

Run the following logs in the test well:

- 1) gamma, for geologic correlation;
- 2) bulk density, for calculating Young's modulus and Poisson's ratio; and
- 3) dipole sonic (acoustic velocity), for calculating Young's modulus and Poisson's ratio.

Run the logs from surface to total well depth after the surface casing has been cemented.

Coring Procedure

Ensure that continuous 4-inch diameter core will be taken from pre-approved depths. A licensed geologist, licensed engineer, or their designee shall log the core on-site.

Photograph and package the core on-site in preparation for laboratory testing.

Package shale stringers and overburden with plastic wrap, aluminum foil, or protective sleeves supplied by the coring company. Package the overburden and salt in a core container strong enough to prevent breakage of the core.

Preserve selected core in an acceptable manner and send to the laboratory for testing. Package the remaining core on-site and send to storage.

Ensure that the core is marked at each foot and the total length is recorded. Ensure that the core container label includes the name/number of the well, the depth interval from which the core was obtained, and the sequential number of the container.

Core Testing

Ensure that the core testing includes the following:

1. Tests for the overburden (usually shale):
 - a) Brazilian indirect tensile strength tests to determine the tensile strength of the shale or overburden rock,
 - b) confined triaxial compression tests to determine the compressive strength of the roof and to determine Young's modulus and Poisson's ratio.
 - c) permeability (horizontal and vertical)
2. Tests for the salt
 - a) Brazilian indirect tensile strength tests to determine tensile strength of the salt
 - b) confined triaxial compression tests to determine compressive strength of the salt
 - c) triaxial creep tests to define the time-dependent creep deformation characteristics of the salt

Determine the number of tests to be conducted for the overburden and the salt cores. Variability of geomechanical properties in the overburden, especially in shale, may require a significant number of tests to characterize the strength of the cavern roof. Ensure that the number and type of tests planned will be adequate to characterize the strength of the roof and the salt. The number of tests required per core must be approved by KDHE.

Test Results

Submit a comprehensive report of the field and laboratory analyses and an interpretation of the test results to KDHE upon completion of the laboratory tests. Assess the potential for subsidence and demonstrate that operational pressure gradients will not cause fracturing of the salt formation. Properly preserve the core and make the core available for inspection upon request from KDHE.